

HSS

# ARTICLE

---

**A500 VERSUS A53: DIFFERENT  
FROM THE INSIDE OUT**

by Kim Olson, PE  
Technical Consultant, Steel Tube  
Institute

by Kim Olson, PE  
Technical Consultant, Steel Tube Institute

Do you know the differences between ASTM A53 and A500? The former is the standard specification for steel, black lacquer coated, welded and seamless steel pipe. It is intended for use in mechanical and pressure applications, as well as for use in ordinary steam, water and air lines. ASTM A500 is the standard specification for cold-formed, welded and seamless carbon steel structural tubing. Available in three grades, A through C, it is intended for use in construction and structural applications. Unlike A53 piping, which is only round, A500 is available in more shape options, most commonly round, square and rectangular.

In addition to these oft-cited differences in intended use between the two steel products, many additional details are critically important for engineers, especially as they relate directly to matters of cost and quality.

## QUALITY AND YIELD STRENGTH

Consider yield strength. No matter the grade, A500 material's yield strength will be greater than A53 piping. Although at one time A53 was the standard specification for round shapes, specifying A53 for columns or braces of a building will result in a thicker, larger section than if you use the stronger A500. Structures designed with A500 require less steel by weight; the cost-saving implications are clear.

In addition, Grade B has been replaced by Grade C (which has a yield strength approximately 10% higher) as the most common grade for A500 HSS with no cost implications. (Note the 15th Edition of AISC Construction Manual due in 2017 will reflect this in the member capacity tables.) This is good incentive to use the highest quality tube available.

## DESIGNATION

Engineers frequently wonder why there are so many fewer options for A53 pipe than A500 rounds.

A53 pipes are designated using a nominal pipe diameter in inches, plus one of three scheduled wall thickness. They are sized this way because A53 pipes—designed to carry pressurized steam, air or water—must work with standardized fittings and valves.

There is no such need with A500 tubes, which are therefore designated with much more precision and accordingly more efficiency. With A500 rounds, the outside diameter and wall thickness in inches is carried to three decimal places. When using A500 round for a building column, you could specify an HSS8.625×0.322 with an outside diameter (OD) tolerance of +/-0.75% and a wall tolerance of +/-10%. The A53 equivalent, an 8 inch standard pipe, has an OD tolerance of +/-1% and a wall tolerance of -12.5%. Hence, an A500 round has better/tighter OD and wall tolerances. Another word to the wise: A53 pipe is available only in lengths of 21' and 42'. A500 rounds can be produced in lengths from 20' to 75'.

## TOLERANCES

As you see, A500 tolerances are tighter than A53 pipe tolerances. When you are selecting section sizes for your structural design, you will have more confidence that you will not only get the cross-sectional dimensions but also the necessary straightness with A500, as A500 producers must also adhere to a straightness tolerance specified in A500. With A53, there is no specification in the standard for how straight the pipe must be.

## INSIDE AND OUT

Thus far, we've focused on these two options' structural characteristics, but what happens on the outside matters just as much. Because the A53 pipe is produced to carry pressurized steam, water or gas, the manufacturer must hydrostatically test their product, ensuring that it can withstand pressure when in use. If you are using A53 piping for structural applications, you can expect to pay for tests your application does not require.

Consider, too, that when you use an A53 pipe, you will pay in part for the sealant that producers use to coat the outside of the pipe. In order to weld to these pipes, a fabricator must remove the sealant you have paid for, an unnecessary cost and extra step in the fabrication process. The bare surface of the A500 tube makes it easier to paint, as well.

Inside and out, the differences between A53 pipes and A500 tubing make clear: these two options are far from synonymous. For a host of structures—from building columns, braces, trusses, space frames and towers—A500 is clearly the appropriate choice.

March 2016

